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## Idrisi and Copernicus, Gama and Ibn Majid

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The Muslims also made remarkable advancements in geography. The march of innovations made by Muslim geographers began with their proof of the roundness of the earth. The Greeks believed that the earth was a circular object, surrounded by ocean water from all directions but the Roman State rejected this idea and later the Christian Church and its earlier fathers, led by Laktanshius (Lucius Caecilius Firmianus Lactantius was an early Christian author (AD 250 — AD 325) who became an advisor to the first Christian Roman emperor, Constantine I, guiding his religious policy as it developed) vehemently adopted this theory. The Christian Church put forward the position that the earth was flat and the other side of the earth was uninhabited; otherwise, people might fall in space.

The Muslims attempted to revive the theory of earth's roundness. Ibn Khardazabah (d. 885 AD) and Al-Idrisi (Abu Abdullah Muhammad al-Idrisi al-Qurtubi al-Hasani as-Sabti, or simply al-Idrisi ( d. 1165 AD ), was an Arab Muslim geographer, Muhammed al-Idrisi born in Ceuta, Morocco, then belonging to the Almorids) postulated that 'The Earth is round like a ball. Water is tightly close to it and remains above it naturally and continuously. Both earth and water are positioned in the universe like yoke inside the egg. They are positioned in the centre, surrounded by the breeze (namely the atmosphere) from all sides'.

Muslim cartographers inherited Ptolemy's geography in the 9th century. His works stimulated an interest in geography but were not slavishly followed and instead, Muslim cartography followed Al-Khwarizmi in adopting a rectangular projection, shifting Ptolemy's prime meridian several degrees eastward, and modifying many of Ptolemy's geographical coordinates.

Al-Idrisi made maps of the world. 'These maps were the greatest maps in cartography in the Middle Ages. They were the most complete, accurate and detailed maps ever. Like most Muslim scientists, Al-Idrisi asserted the roundness of the Earth and viewed that this fact is unquestionable', according to Will Durant (1993). So the theory of the roundness of the earth was formulated by the Muslims

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long before Copernicus (d. 1543 AD). The *Tabula Rogeriana* (one of the most advanced world map in the medieval period) was drawn by Al-Idrisi in 1154 for the Norman King Roger II of Sicily, after a stay of eighteen years at his court, where he worked on the commentaries and illustrations of the map. His map inspired Christopher Columbus and Vasco Da Gama in their voyages.

Al-Idrīsī considered the extent of the so far explored world to be 160 degrees and had to symbolize 50 dogs in longitude and divided the region into ten parts, each 16 degree wide. In terms of latitude, he partitioned the known world into seven ‘climes’, determined by the length of the longest day.

On the work of al-Idrisi, S. P. Scott commented: ‘The compilation of Edrisi marks an era in the history of science. Not only is its historical information most interesting and valuable, but its descriptions of many parts of the earth are still authoritative. For three centuries geographers copied his maps without alteration. The relative position of the lakes which form the Nile, as delineated in his work, does not differ greatly from that established by Baker and Stanley more than seven hundred years afterwards, and their number is the same. The mechanical genius of the author was not inferior to his erudition. The celestial and terrestrial planisphere of silver which he constructed for his royal patron was nearly six feet in diameter, and weighed four hundred and fifty pounds; upon the one side the zodiac and the constellations, upon the other—divided for convenience into segments—the bodies of land and water, with the respective situations of the various countries, were engraved (*History of the Moorish Empire in Europe*)

Al-Mamoun (d. 833 AD) decided to measure the dimensions of the earth. He assigned two teams of astronomers and geographers to go to two different locations, east and west, and then to measure one degree of the longitude lines (360 in number). The average measurement by these two teams was 56.66 miles approximately, while the average measurement by contemporary science is 56.93 miles. The teams also measured the diameters of the earth as approximately 41,248 km, a measurement that now stands at 40,070 km; the error percentage in the measurements made by Al-Mamoun’s teams does not exceed (3%).

Abu Ali Al-Marakishy (d. 1262 AD) set longitude and latitude lines on maps of the earth to help Muslims specify prayer times all over the world and it facilitated drawing geographical maps. The

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Islamic maps and the publications of Muslims about marine sciences have markedly influenced the progress of western navigation.

Ali-bin-Omar Al-Katbi (d. 1277 AD), Qotb-Al-Din Shirazi (d. 1311 AD), and Abu Al-Farag Ali were the first scientists in human history to refer to the possible rotation of the earth around the sun, one rotation every day and night. George Sarton, the Belgian-American chemist, considered by most as the father of the history of science states in his *History of Science, Vol. 3*, 'the research of those three scientists during the thirteenth century did not pass unnoticed. It was one of the factors that influenced the research of Copernicus in his theory announced in AD 1543'.

Al-Beruni, while working in the area of present day Pin Dadan Khan Pakistan, measured the radius of the earth, a measurement that is only 15 km short of the present day accepted measurement of the earth.

By virtue of their knowledge of geography, the Muslims gained control and mastery over sea routes and tourism. Vasco De Gama (d. 1524 AD), the famous Portuguese sailor, discovered the sea route between India and Europe, which went through Cape of Good Hope. This great sea discovery was made possible with the help of a Muslim Arab mariner, Ahmad Ibn Majid, who in 1498 piloted Vasco De Gama from Africa to India. The Muslim Sultan of Mozambique made available this mariner to him (Britannica).

Muslims also had a role in the discovery of the New World. Columbus discovered America in AD 1506. Hitti, the American scholar, writes that the Muslims kept alive the ancient doctrine of the spherical nature of the earth, without which the discovery of America would not have been possible. An exponent of this doctrine was a Muslim scientist named Abu Ubaidah Muslim al-Baalini, who had written a book on the topic. His theories flourished in the first half of the 10<sup>th</sup> century. The books containing the theory of the sphericity of the earth were translated from Arabic into Latin and were published in Europe in 1410 AD. From these publications, Columbus learnt the theory of sphericity.

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